



## **What is Pyramid PhotoBioReactor?**

Pyramid PhotoBioReactor is a customizable, fully automatic, computer controlled, high productivity guaranteed system that makes it possible to grow massive amounts of any micro-algae in every climate.

## **Why “Pyramid” Body Design?**

Patented “Pyramid” body design allows the system to use the sunlight in the most efficient way.

For instance, in case of low light, internal lights are being used to support maximum production with the optimal light intensity.

This results low electricity consumption while keeping constant light density for maximum production values.

High-tech, ultra-durable and termo-isolated materials prevent any energy loss from the system and also prevent overheating.

Angular body design allows air-lifting technology which reduces pumping costs and deformation of the micro-algal cell walls as known in tubular systems.

**(We do not accept any modifications on this part)**

## **Medical Acrylic Body Plexi**

Pyramid Plexies are made up of medical acrylic plexi that has the lowest micropore capacity , preventing microalgal adhesions on the material and non-toxic. Special silicon based glues are used for non-toxicity. High light radiation (far IR-UVb) penetration is achieved with this material.

## **Backlights**

Special florescent lamps (He-Ne-Mg/Al based) are used in order to make the cell membranes stronger, increase the chlorophyll content, eliminate unwanted protozoa contaminations. These lights provide UVb, mid-red, mid-blue (triple) at the SAME time.



## **Control Panel and Circuits**

According to the information, that is gathered by the black box is sent to the control panel and then the control panel decides how these devices should operate in each second.

You can monitor every process of each device simultaneously.

Control Panel has system administrator warnings (internet/telephone) when the system supplement insufficiencies (chemicals/nutritions) occur.

**(We do not accept any modifications on this part)**

## **Black Box Secrets...**

Computerized control box allows the system to check and control every device and process such as pH, temperature, dissolved O<sub>2</sub>, dissolved CO<sub>2</sub>, light, circulation, algae density, medium level with special sensors monitoring every second.

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## **Medium Pump**

Medium pump is regulated by the information gathered from the black box and the orders sent by the computerized control panel.

Medium pump has a special A.H.S.T. (Anti-Hydro-Stress-Technology) for large scale biomass production.

**(We do not accept any modifications on this part)**

## **Air Pump**

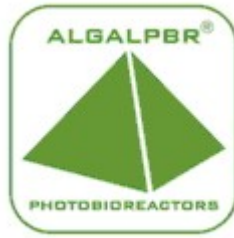
Filtered and pressure regulated air is pumped for continuous operations. This special pump operates real-time (has no condenser tank) and prevents Fe oxidation and microbiological contamination.

**(We do not accept any modifications on this part)**

## **Twilight Zone (Heating, Mid-level Illuminating and Sterilization Tank)**

A-class energy saving technology by oil based heating allows the system temperature in optimal range and prevents sudden temperature changes to maintain a healthy biomass.

M.L.I.T. (Mid-level Illuminating Tech.) prevents the micro-algae from sudden light changes.



Before inoculating a new culture to the system, sterilization device is used to prevent any contamination from the medium by using embedded UV lamps inside the tank.

### **Cooling Tank**

A-class energy saving technology by micro-chip devices stabilizes the system temperature without any unwanted gasses to maintain a healthy biomass.

### **Feeding Unit**

Feeding unit, which consists of 4 unit external gas inputs, 4 unit liquid nutrient/medium matter inputs, air pump and air pump filter is regulated automatically when chemical & nutritional insufficiencies occur.

### **Harvest Units (Filters and Pumps)**

Hydrocyclone & Membrane Filters receive orders from control panel & black box. The best harvest time is detected depending on the concentration, that is pre-setted by the administrator via software and it can harvest the biomass until it has optimal density.

### **System Software**

PC software includes; control panel connection, system tuning (also via internet); real-time processing and full system control from anywhere on the world.

Visual communication with the system via cameras, giving the possibility to fully control the system and visual monitorization from anywhere on the world.

Computerized automatic administration and monitorization on every process and correction of errors.

### **Microalgae Magnetic Duplicator (Madmic ® )**

Ultra-high microwave based microalgae duplicator is a powerful electronic oscillator, that sends approximately 70 GHz electromagnetic frequency fields to microalga cells, while circulating the medium.



Madmic ® sends special high-power MF resonances to the microalgae cultures. MF resonances improve the microalgae cells and increase duplication.

- Decrease duplication time more than 5 times
- Improve cells
- Decrease adaptation time more than 6 times
- Increase chlorophyll amount
- Increase young cells

### **System Advantages/Properties**

- Patented Pyramid-built body allows the PBR system to use the sunlight in the most efficient way and in case of low light, internal lights are being used to support maximum production with the optimal light intensity. This ends up with/results low electricity consumption while keeping constant light density for maximum production values.

- High technology system monitorization
- Special tank isolation against temperature losses
- Full system control on every process/device
- Computerized automatic administration
- Ultra durable system devices
- Customizable system with optional devices
- Automatic monitorization on every process and correction of faults.
- Automatic medium feeding depending on chemical insufficiencies
- System administrator warnings (internet/telephone) when the system supplement insufficiencies (chemicals/nutritions) occur.
- pH, temperature, dissolved O<sub>2</sub>, dissolved CO<sub>2</sub>, light, circulation, algae density, medium level sensors monitoring 7 / 24 and fixing possible errors before they occur
- Automatic cooling / heating depending on various conditions
- UV sterilization technology
- Patented Microalgae Magnetic Duplicator (Madmic®)
- Automatic valve technology



- Air, hydrocyclone and membrane filter technology
- PC software including; control panel connection, system tuning via internet; enabling real-time processing and controlling all the system from all over the world.
- Algae density meter allowing automatic “harvest-time” warning system
- Visual communication to the system via cameras, giving the possibility to fully control the system and visual monitorization from all over the world.